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(71) Applicant
Fothergill & Harvey
Limited
Summit
Littleborough
County of Lancaster
(72) Inventor
Philip Tattersall
(74) Agents
J Owden O'Brien & Son
53 King Street
Manchester
M2 4LQ

(54) Surgical operating tables

(57) A cantilever operating table comprises a table top comprising carbon or synthetic organic fibre skins 5 bonded to aluminium side members 4 and a thermo-plastic foam core 6 to render the patients carrying portion of the table top free from metallic support for total accessability of x-rays at all points along its length.

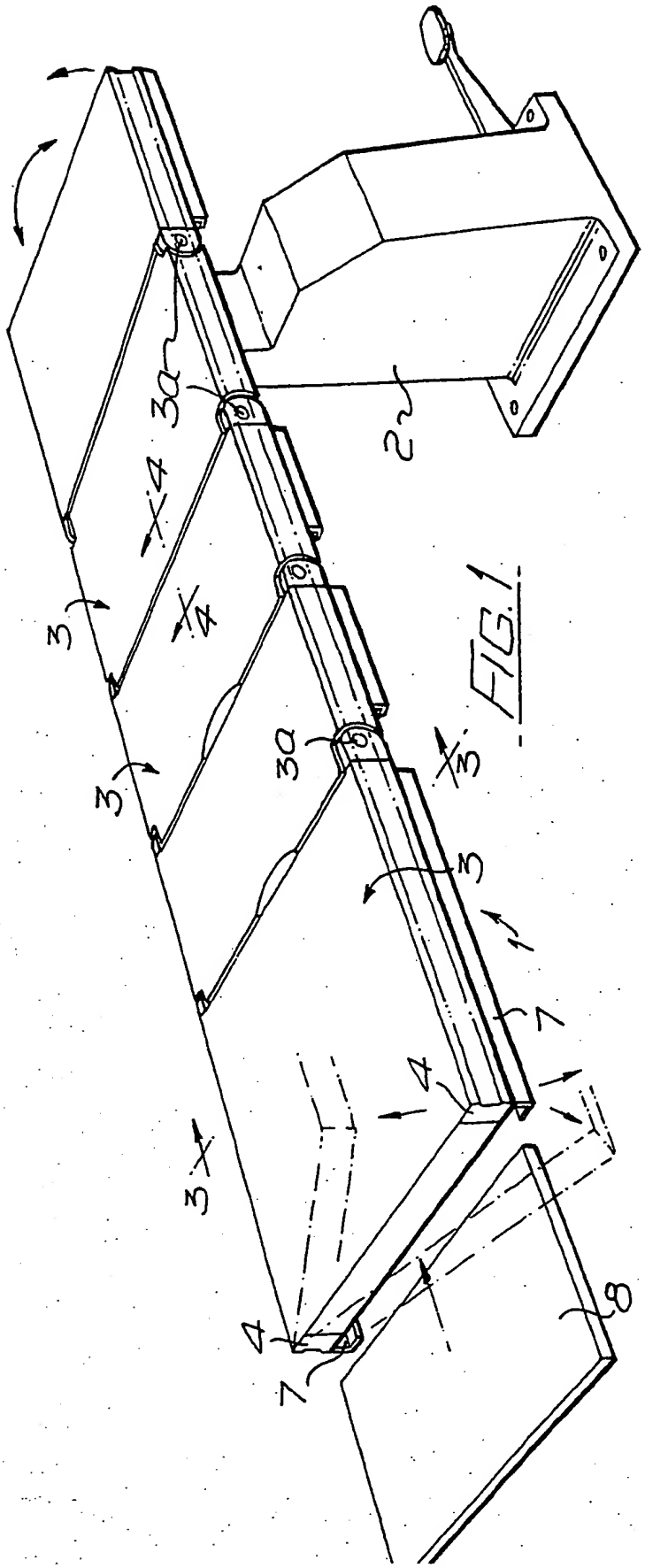

FIG. 1

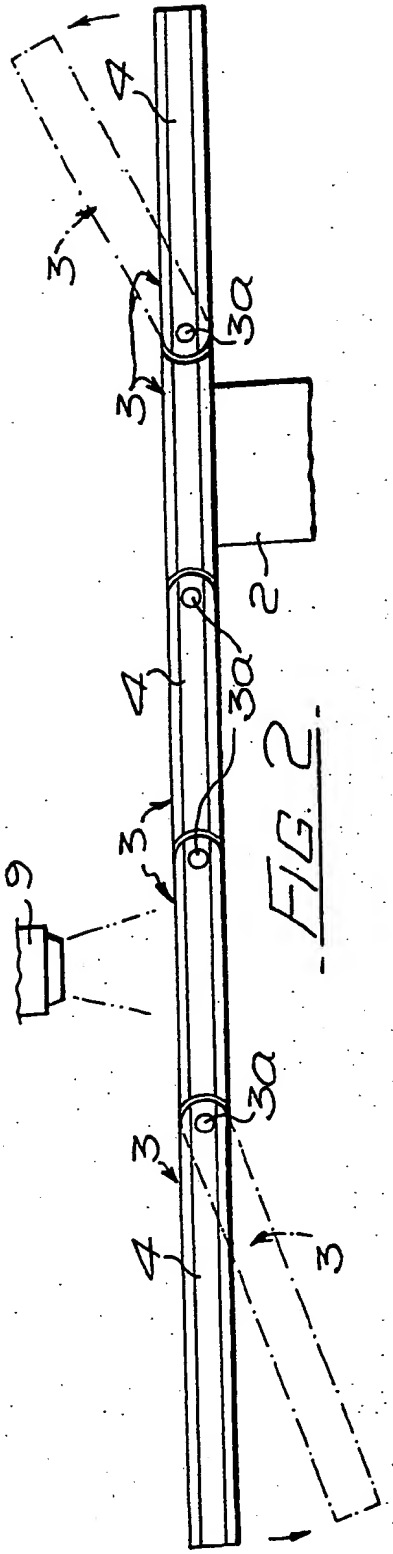

FIG. 2

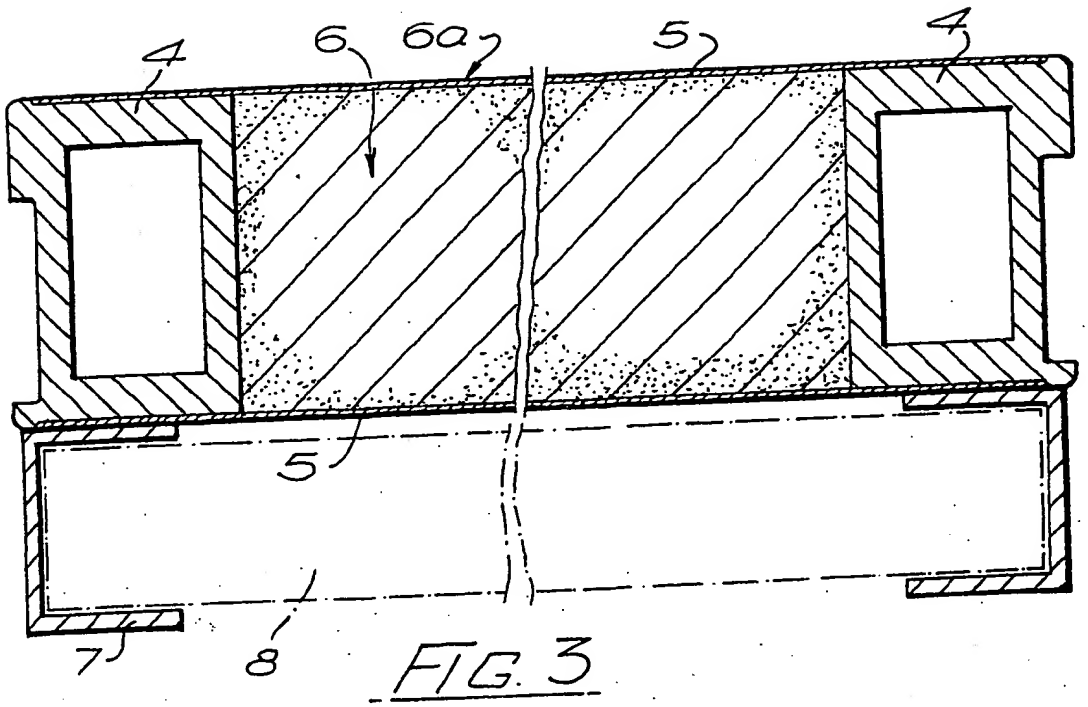

FIG. 3

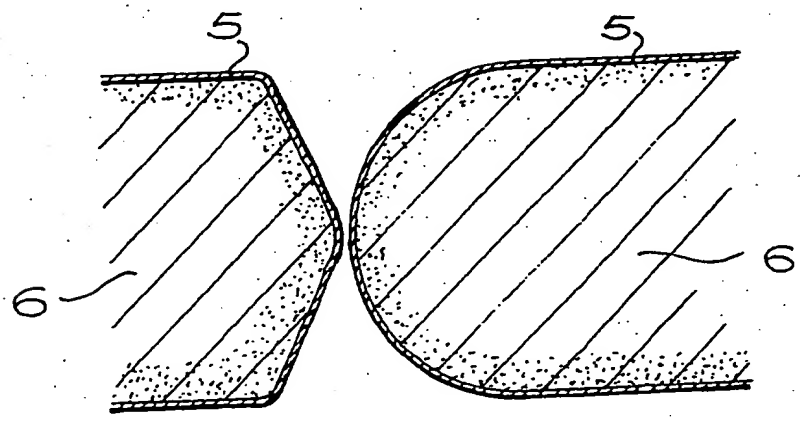

FIG. 4

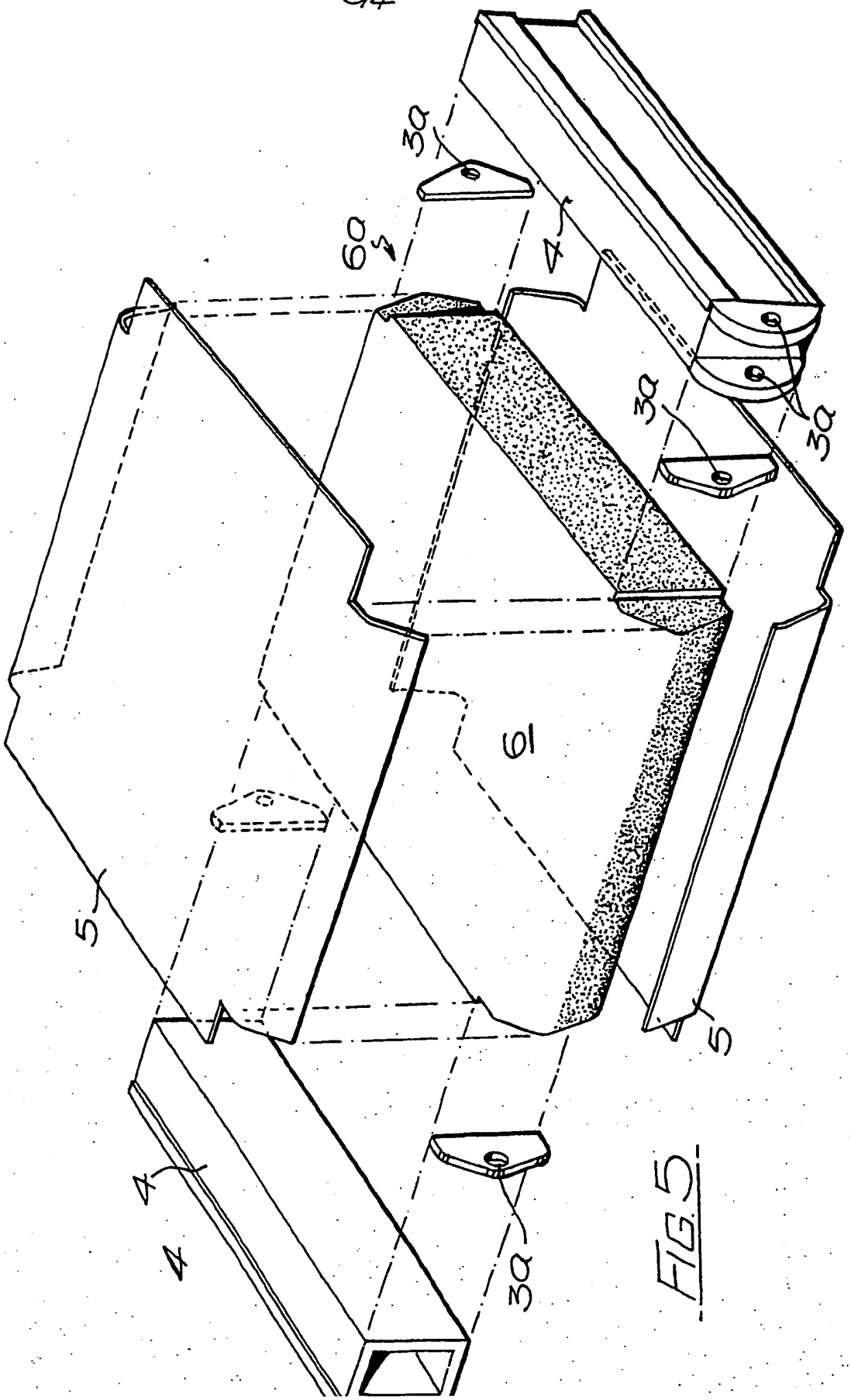

FIG 5

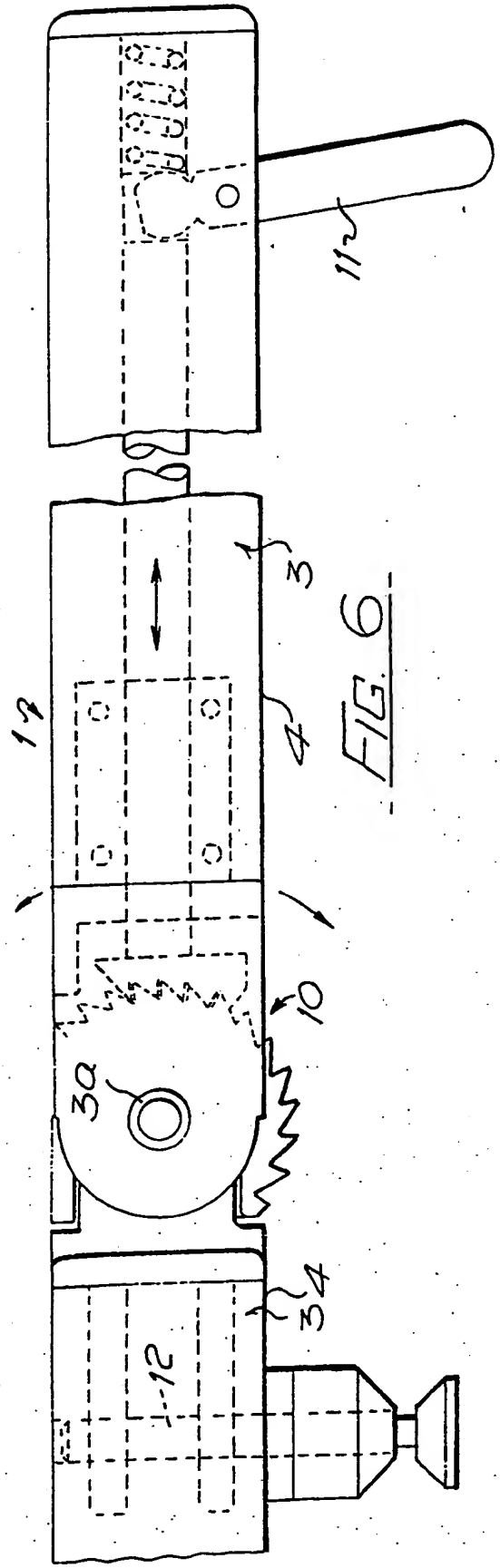

FIG. 6

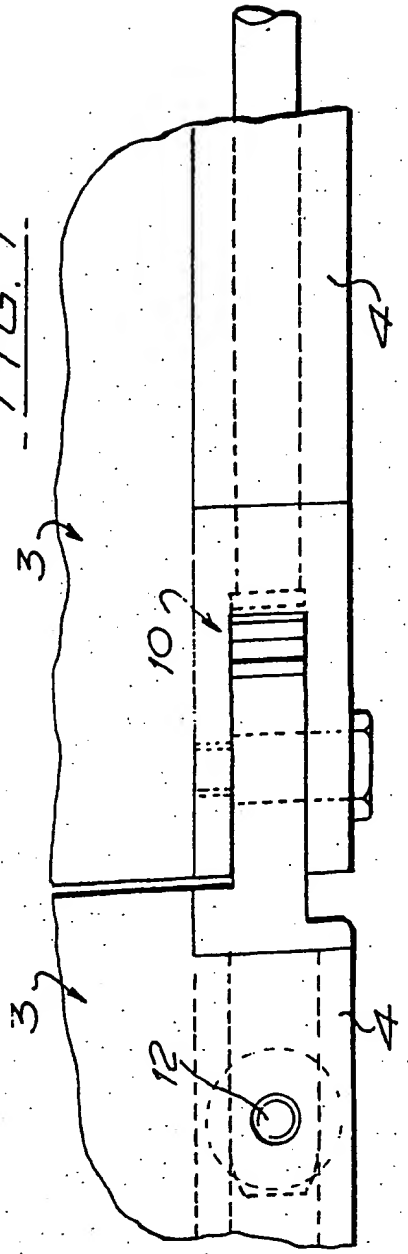

FIG. 7

SPECIFICATION

Improvements in surgical operating tables

This invention relates to improvements in surgical operating table tops.

It is well known that carbon fibre composites have a transparency to x-ray, are light with high strength and rigidity and when formed as a skin over thermoplastic foam provide a rigid sandwich table top material.

It is evident that the increasing use of radiology as an important tool in operating surgery necessitates completely new thinking in the design of operating tables. Equally acknowledged is the fact that x-ray exposure is potentially harmful, and it is the continuing responsibility of the medical profession to conduct x-ray examination with maximum efficiency avoiding unnecessary exposures by all available means consistent with the acquisition of necessary diagnostic information. Existing operating tables have a top consisting of thick aluminium cast sections (i.e. 3, 4 or 5 sections) which is mounted on a central support column. Although this forms a strong stiff structure it is not x-ray translucent. In order to build x-ray facilities into the operating table top thin (10 mm thick) x-ray translucent panels (i.e. polycarbonate, perspex, bakelite) are used in certain accessible areas to replace part of the aluminium top structure. This has had the effect of drastically reducing the structural stability of the table top while only giving very limited x-ray accessability. The carbon fibre structure proposed overcomes the above mentioned problems by vastly improving both x-ray absorption and structural properties of existing operating table tops.

By using composite sandwich panels of the proposed construction the x-ray absorption is reduced by up to 50% compared with the thin x-ray translucent panels currently used. It has been shown that by using this construction considerable radiation reduction can be achieved with positive effects on image quality. This reduction in patient dosage gives a longer life to the expensive x-ray tubes employed in the radiographic processes.

The low absorption properties of the proposed construction, combined with low weight allows sections to be used which gives an operating table top with high strength/stiffness characteristics. This allows the top to be edge mounted in a configuration that enables x-ray scans/slots to be taken over the full area of the operating table top. The operating team as well as x-ray apparatus and Image intensifiers have free access under the table top.

Due to the strength and stiffness of the proposed construction the panel sections can be actuated by mechanisms driven on one side only as opposed to both sides on existing tables thereby effectively reducing the number of actuating mechanisms used. Discrete joints/hinges are incorporated into the panels allowing actuation to be made by hydraulic, pneumatic or manual means. It is usual for some panel sections to be removable and interchangeable and the lightweight C.F.R.P. panels proposed make handleability more efficient.

According to the invention a surgical operating table comprises a cantilever mounted multi-position table top composed of carbon or synthetic organic fibre composite skins bonded to aluminium side members and a thermoplastic foam core to render the patient carrying portion of the table top free from metallic support for total accessability of x-rays at all points along its length.

The invention will be described with reference to the accompanying drawings:–

Figure 1 is a perspective view of the cantilever table,

Figure 2 is a side elevation thereof,

Figure 3 is an enlarged section on line 3–3 Fig. 1,

Figure 4 is a detail section enlarged on line 4–4 Fig. 1,

Figure 5 is an exploded view of the carbon fibre assembly,

Figure 6 is a side elevation of the ratchet and pawl mechanism,

Figure 7 is a plan view of same.

The cantilever table top 1 is adjustably mounted on a pedestal 2 to be capable of tilting horizontally and vertically in either direction and comprises a plurality of sections 3 hinged together at 3*a* so as to be individually, positionally adjustable. The end deflection under combined torsional and flexural loading over 1300 mm cantilever length should not exceed 25 mm under an eccentric load of 135 KG (this deflection represents the loating if an individual sits on one corner of the table top). An eccentric load (applied at the same point) of 255KG must not cause any permanent deformation and the table top shouls withstand 100,000 cycles when subjected to the 135 KG eccentric load condition.

Each section 3 of the table top comprises an aluminium extrusion side member or boom 4 connected by carbon fibre or synthetic organic fibre composite skins 5 combined with a thermoplastic foam core 6 to form a sandwich panel 6*a*. The alloy side member or booms 4 are incorporated in the panel construction first to take bending loads and provide flexural stiffness, and secondly as a means of connecting the individual panel sections with hinge joint mechanisms, and for side attachment of operating accessories. The actuating mechanism for locking the hinges in position is provided on one side of the side booms.

The carbon fibre or synthetic organic fibre skins 5 are in the form of undirectional; crossplied or woven reinforcement with a thermosetting resin matrix.

Carbon fibres typically possess strengths of 1.4 to 3.0 GPa; and Youngs moduli of elasticity of 200 to 440 GPa.

The preferred resinous matrix material in which the carbon fibres are diagnosed is a thermosetting resin e.g. epoxy resin, polyester resin or phenolic resin.

The core material 6 is a rigid, structural thermoplastic foam shaped to the predetermined form, and is a low x-ray attenuation medium.

The extruded rectangular box section (Fig. 3) is preferably of aluminium alloy grade HE30, which is a high strength, corrosion resistant metal and is anodised as a pre treatment process to improve the bonding of the composite skins 5 and the foam core 6 of the panels 6a. The composite skins 5 forming the table top are cured in an autoclave under a pressure of 0.6 MPa at a temperature of 300°F, the shape of the skins being determined by the use of a moulding tool. The foam core 6 is machined to the pre-determined panel shape and size. The carbon fibre skins, foam core and aluminium extrusion are then bonded together in a stepwise operation using flexible toughened epoxy resin adhesives.

Alternatively, the entire panel assembly may be fabricated in a "one-shot" moulding operation using a moulding tool, and curing the composite skins and bonding the panel assembly in a single stage operation.

Subsequent to fabrication the sandwich panels 6 undergo machining operations for attachment of the hinge joints and actuating mechanisms to the aluminium extrusion sidemembers or booms 4.

Finally the composite skins are varnished with a polyurethane lacquer finish to improve their scratch resistance.

Referring to Figs. 6 and 7 and ratchet and pawl 10 is actuated by an engaging/disengaging hand lever 11. Each panel is connected to an adjacent panel by a pin 12 passing through the fork end of the next panel.

Channels 7 are bonded or bolted to the underside of the edges of the lower skin 5 to receive x-ray cassettes 8 which may be slid along the channels under any particular portion of the body to obtain photos from an x-ray apparatus 9.

The x-ray attenuation value should be a maximum and consistent value of 1 mm aluminium equivalence at 100 KV, in line with proposed safety regulations on patient dosage.

The table top surface must be flat, smooth and scratch resistant; and easily cleanable using clinical cleaning solutions.

CLAIMS (20 Aug 1980)

1. A surgical operating table top comprising a cantilever mounted multi-position table composed of carbon or synthetic organic fibre composite skins bonded to aluminium side members and a thermoplastic foam core to render the patient-carrying portion of the table top free from metallic support for total accessability of x-rays at all points along its length.

2. A surgical operating table top as in Claim 1, in which the carbon or synthetic organic fibre composite is bonded to longitudinal side members at each side, the side members being mounted on a pedestal at one end capable of tilting in any direction.

3. A surgical operating table top as in Claims 1 and 2 constructed in sections pivotally hinged together and capable of individual movement in vertical planes.

4. A surgical operating table top as in Claims 1 to 3 in which each section forms a panel comprising top and bottom skins of the carbon or synthetic organic fibres composite with a foam core sandwiched there between, the composite skins and foam core being bonded together and to the side members of each section.

5. A surgical operating table top as in any of Claims 1 to 4 in which channels are bonded or bolted to the underside of the lower skin and side members to receive x-ray cassettes which may be slid along the channels to obtain x-ray photos of any particular part of a body on the table.

6. A cantilever surgical operating table top substantially as described with reference to the accompanying drawings.

CLAIMS (30 Dec 1980)

1. A surgical operating table comprising a cantilever mounted multi-position table composed of carbon or graphite fibre composite skins bonded to aluminium side members to render the patient-carrying portion of the table top free from matallic support for total accessability of x-rays at all points along its length, in which the carbon or graphite fibre composite is bonded to longitudinal box frames at each side, the box frames being mounted on a pedestal at one end of the table to be capable of tilting in either direction.

2. A surgical operating table as in Claim 1 constructed in sections pivotally hinged together for relative movement.

3. A surgical operating table as in claims 1 or 2 in which each section forms a panel comprising top and bottom skins of the carbon or graphite composite with a foam core sandwiched therebetween, the composite skins and foam core being bonded together and to the box frames of each section.

4. A surgical operating table as in any of claim 1 to 3 in which channels are bonded to the underside of the lower skin to receive x-ray plates which may be slid along the channel to obtain x-ray plates of any particular part of a body on the table.

5. A surgical operating table as in any of

claims 1 to 4 in which the ends of the composite skins of adjacent sections are bonded together to form a continuous table top.

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